U. S. FOREST SERVICE

RESEARCH NOTE NC-52

NORTH CENTRAL FOREST EXPERIMENT STATION, FOREST SERVICE—U.S. DEPARTMENT OF AGRICULTURE

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Antibiotics Do Not Control Blister Rust in Eastern White Pine Seedlings

ABSTRACT. — To prevent blister rust infections in Eastern white pine seedlings, the antibiotics, cycloheximide (Acti-dione) and Phytoactin, were tested in root dips, root slurries, and foliar drenches before planting and after planting the trees. None of the methods and materials tested was effective.

The antibiotics, cycloheximide (Acti-dione) and Phytoactin, have been extensively tested as a control measure for white pine blister rust (*Cronartium ribicola* Fischer) in sapling, pole, and mature stands of Eastern white pine (*Pinus strobus* L.), Western white pine (*P. monticola* Dougl.), and sugar pine (*P. lambertiana* Dougl.). These antibiotics were reported to have controlled branch and trunk cankers on Western white pine (*3*, *4*), but not on Eastern white pine (*5*, *6*, 7), or sugar pine (*2*). More recent findings, however, have indicated that the antibiotics are not an effective control method on Western white pine (*1*).

Moss (*4*) reported that Phytoactin (0.25- and 4-percent concentrations) soil drenches and slurry root dips were most promising as a protectant against blister rust infections in 1-, 2-, and 3-year-old Western white pine seedlings. Cycloheximide and its derivatives also reduced infection, but were too toxic to seedlings to be used as a practical nursery soil drench treatment. Van Arsdel (*8*), using 4-year-old potted Eastern white pine with patch-grafted cankers, reported that foliar sprays of cycloheximide (100 ppm) and Phytoactin (100 ppm) on new shoot and needle growth killed the cankers.

In the Lake States the highest mortality to seedlings due to blister rust infection usually occurs during the first 5 years after outplanting. If systemic antibiotic treatments could protect seedlings during these years, chances for fatal infection and subsequent tree death would be greatly reduced.

The experiment reported here tested the effectiveness of preplanting and postplanting applications of antibiotic root dips, root slurries, and foliar drenches in preventing blister rust infections on Eastern white pine seedlings.

Treatments

On May 6, 1963, a sunny cool day, bundles of twenty-five 3-0 seedlings were completely dipped or root-slurred in Phytoactin or cycloheximide solutions at the nursery and then machine-planted in a 3x5-foot spacing in an open field. The experimental design was a randomized complete block consisting of 12 treatments (table 1) of 100 seedlings each replicated 5 times. Triton X-100 (0.1 percent) was used as a surfactant in the cycloheximide treatments. Untreated trees were used as controls.

The post-planting treatments differed from the pre-planting treatments in several ways: (a) They were applied as foliar drenches from 3-gallon backpack sprayers in July 1963 to trees planted in 1962 as 2-0 stock; the same trees were treated again in 1964. (b) There were only 9 treatments (table 2), replicated 4 times. And (c) they were applied on cloudy humid days.

Table 1. — Amount of blister rust infection occurring on Eastern white pine seedlings treated with antibiotics before planting[1]

Treatment and concentration	Method of application	Percentage of seedlings infected by 1967
Phytoactin L-456 + water (1200 ppm)	Complete dip	[2]/ 12.3
Phytoactin L-414 + water (500 ppm)	Root slurry	15.4
Phytoactin L-413 + water (250 ppm)	Root slurry	16.3
Phytoactin L-380 + water (300 ppm)	Complete dip	16.8
Control (no treatment)		17.2
Phytoactin L-381 + water (600 ppm)	Complete dip	17.4
Phytoactin L-415 + water (1000 ppm)	Root slurry	19.7

[1]/ The following complete dip treatments caused such severe tree mortality that no data were taken:
Semicarbazone 1% WP (wettable powder) + water + Triton X-100 (50 ppm)
Semicarbazone 3% suspension + water + Triton X-100 (50 ppm)
Acti-dione ferrated 5% WP + water + Triton X-100 (50 ppm)
Actispray + water + Triton X-100 (50 ppm)
Actispray + water + Triton X-100 (25 ppm)

[2]/ Light to moderate phytotoxicity which resulted in considerable foliage loss.

Table 2. — Amount of blister rust infection occurring on Eastern white pine seedlings treated with antibiotics after planting

Treatment and concentration	Percentage of trees infected by 1967
Actispray + water + Triton X-100 (50 ppm)	[1]/ 9.6
Acti-dione ferrated 5% WP + water + Triton X-100 (25 ppm)	[1]/ 10.2
Actispray + water + Triton X-100 (25 ppm)	[1]/ 10.5
Semicarbazone 1% WP + water + Triton X-100 (50 ppm)	[1]/ 13.2
Phytoactin L-380 + water (300 ppm)	20.3
Phytoactin L-456 + water (1200 ppm)	23.0
Control (no treatment)	23.3
Phytoactin L-381 + water (600 ppm)	23.7
Semicarbazone 3% suspension + water + Triton X-100 (50 ppm)	([2]/)

[1]/ Moderate to severe phytotoxicity caused considerable mortality or reduced the amount of foliage on surviving trees by at least 50 percent.
[2]/ Trees killed or severely injured by the treatment.

Data on the amount of blister rust infection were taken annually beginning in summer 1965. Plentiful ribes (*Ribes cynosbati* and *hirtellum*) in the area were responsible for the high levels of infection obtained.

Results

By 1967, from 12 to 20 percent of the seedlings treated with Phytoactin before planting were infected (table 1). (The slight differences in percentages by treatment do not have practical value.) The cycloheximide treatments had caused such severe tree mortality that no data were taken. For the post-planting treatments, 10 to 24 percent of the trees were infected by 1967. In addition, the cycloheximide treatments had caused moderate to severe phytotoxicity on most of the surviving trees.

The tests show that Phytoactin does not protect Eastern white pine seedlings against blister rust infection; and cycloheximide is too toxic to be used for that purpose.

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1968

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